

NOTICE OF REVISION (NOR) (See MIL-STD-480 for instructions) This revision described below has been authorized for the document listed.		DATE (YYMMDD) 92/11/30	Form Approved OMB No. 0704-0188
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1. ORIGINATOR NAME AND ADDRESS Defense Electronics Supply Center Dayton, Ohio 45444-5277		2. CAGE CODE 67268	3. NOR NO. 5962-R027-93
		4. CAGE CODE 67268	5. DOCUMENT NO. 86027
6. TITLE OF DOCUMENT MICROCIRCUITS, 4-BIT BIPOLAR MICROPROGRAM SEQUENCER, MONOLITHIC SILICON.		7. REVISION LETTER (Current) REV B	(New) C
		8. ECP NO. 86027ECP-1	
9. CONFIGURATION ITEM (OR SYSTEM) TO WHICH ECP APPLIES ALL			
10. DESCRIPTION OF REVISION Sheet 1: Revisions ltr column; add "C" Revisions description column; add "Changes in accordance with NOR 5962-R027-93". Revisions date column; add "92-11-30". Revision level block; add "C". Revision status of sheet; for sheets 1,4 add "C". Sheet 4: Table I, (I _{IL}) Input low current change the maximum limit for Push/pop, \overline{OE} from: -0.72 mA to: -0.76 mA Table I, (I _{IL}) Input low current change the maximum limit for others from: -0.36 mA to: -0.41 mA. Revision level block; add "C".			
11. THIS SECTION FOR GOVERNMENT USE ONLY			
a. CHECK ONE <input checked="" type="checkbox"/> EXISTING DOCUMENT SUPPLEMENTED BY THIS NOR MAY BE USED IN MANUFACTURE. <input type="checkbox"/> REVISED DOCUMENT MUST BE RECEIVED BEFORE MANUFACTURER MAY INCORPORATE THIS CHANGE. <input type="checkbox"/> CUSTODIAN OF MASTER DOCUMENT SHALL MAKE ABOVE REVISION AND FURNISH REVISED DOCUMENT TO:			
b. ACTIVITY AUTHORIZED TO APPROVE CHANGE FOR GOVERNMENT DESC-ECC		SIGNATURE AND TITLE Monica L. Poelking CHIEF MICROELECTRONICS BRANCH	DATE (YYMMDD) 92/11/30
12. ACTIVITY ACCOMPLISHING REVISION DESC-ECC		REVISION COMPLETED (Signature) Jeffery Tunstall	DATE (YYMMDD) 92/11/30

REVISIONS																			
LTR	DESCRIPTION										DATE (YR-MO-DA)					APPROVED			
A	Convert to military drawing format. Add case outline Z, change case outline 3 lead finish from C to A for vendor part number AM2909A/B3A. Add vendor CAGE number 50088 to drawing.										1987 OCT 7					M. A. Frye			
B	Table I, change I _{H2} test conditions. Editorial changes throughout.										1988 SEP 27					M. A. Frye			
CURRENT CAGE CODE 67268																			
REV																			
SHEET																			
REV	B	B	B	B	B														
SHEET	15	16	17	18	19														
REV STATUS OF SHEETS				REV		B	B	B	B	B	B	B	B	B	B	B	B	B	B
				SHEET		1	2	3	4	5	6	7	8	9	10	11	12	13	14
PMIC N/A				PREPARED BY Greg A. Pitz						DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444									
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A				CHECKED BY Ray Monnin															
				APPROVED BY Michael A. Frye															
				DRAWING APPROVAL DATE 24 FEBRUARY 1986															
				REVISION LEVEL B						SIZE A	CAGE CODE 14933		86027						
						SHEET 1 OF 19													

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

<u>86027</u>	<u>01</u>	<u>X</u>	<u>X</u>
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit</u>
01	2909A	Microprogram sequencer

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
X	D-10 (28-lead, 1.490" x .610" x .232"), dual-in-line package
Y	Figure 1 (28-lead, .415" x .400" x .090"), flat package
Z	F-11 (28-lead, .740" x .380" x .090"), flat package
3	C-4 (28-lead, .460" x .460" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Supply voltage range	-0.5 V dc to +7.0 V dc
Input voltage range	-0.5 V dc to +5.5 V dc
Storage temperature range	-65° C to +150° C
Maximum power dissipation (P_D) ^{1/}	770 mW
Lead temperature (soldering, 10 seconds)	+300° C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases X, Z, 3	See MIL-M-38510, appendix C
Case Y	14° C/W ^{2/}
Junction temperature (T_J)	+175° C
DC output current, into inputs	30 mA
DC input current	30 mA to +5.0 mA

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	4.5 V dc minimum to 5.5 V dc maximum
Minimum high level input voltage (V_{IH})	2.0 V dc
Maximum low level input voltage (V_{IL})	0.8 V dc
Case operating temperature range (T_C)	-55° C to +125° C

^{1/} Must withstand the added P_D due to short circuit test; e.g., I_{OS} .
^{2/} When a thermal resistance value for this case is included in MIL-M-38510, appendix C, that value shall supersede the value indicated herein.

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2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Case outlines. The case outlines shall be in accordance with 1.2.2 herein and figure 1.

3.2.2 Logic diagram. The logic diagram shall be as specified on figure 2.

3.2.3 Terminal connections. The terminal connections shall be as specified on figure 3.

3.2.4 Truth table. The truth table shall be as specified on figure 4.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.5 herein.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C V _{CC} = 5.0 V ±10% unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Output high voltage	V _{OH}	V _{CC} = minimum, I _{OH} = 1.0 mA V _{IN} = V _{IH} or V _{IL}		1, 2, 3	2.4		V
Output low voltage	V _{OL}	V _{CC} = minimum, I _{OL} = 16 mA V _{IN} = V _{IH} or V _{IL}		1, 2, 3		0.5	V
Input high level	V _{IH}			1, 2, 3	2.0		V
Input low level	V _{IL}			1, 2, 3		0.8	V
Input clamp voltage	V _{IC}	V _{CC} = minimum, I _{IN} = -18 mA, all others		1, 2, 3		-1.5	V
Input low current	I _{IL}	V _{CC} = maximum V _{IN} = 0.4 V	C _n	1, 2, 3		-1.08	mA
			Push/pop, OE			-0.72	
			Others			-0.36	
Input high current	I _{IH1}	V _{CC} = maximum V _{IN} = 2.7 V	C _n	1, 2, 3		40	μA
			Push/pop, OE			40	
			Others			20	
Input high current	I _{IH2}	V _{CC} = maximum V _{IN} = 5.5 V	C _n push/pop	1, 2, 3		0.2	mA
			Others			0.1	
Output short circuit current 1/	I _{OS}	V _{CC} = 6.0 V V _{OUT} = 0.5 V	Y ₀ Y ₃	1, 2, 3	-30	-100	mA
			C _{n+4}		-30	-85	
Power supply current	I _{CC}	V _{CC} = maximum 2/	T _C = -55°C to +125°C	1, 2, 3		140	mA
			T _C = +125°C		2	110	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C V _{CC} = 5.0 V ± 10% unless otherwise specified			Group A subgroups	Limits		Unit
						Min	Max	
Output OFF current	I _{OZL}	V _{CC} = maximum	Y ₀₋₃	V _{OUT} = 0.4 V	1, 2, 3		-20	μA
	I _{OZH}			V _{OUT} = 2.7 V			20	
Functional tests		See 4.3.1c			7, 8			
Setup time 1 RE	t _{s1}	See figures 5 and 6 C _L = 50 pF			9, 10, 11	19		ns
Hold time 1 RE	t _{h1}				9, 10, 11		5	ns
Setup time 2 R _i	t _{s2}				9, 10, 11	12		ns
Hold time 2 R _i	t _{h2}				9, 10, 11		5	ns
Setup time 3 PUP	t _{s3}				9, 10, 11	27		ns
Hold time 3 PUP	t _{h3}				9, 10, 11		5	ns
Setup time 4 FE	t _{s4}				9, 10, 11	27		ns
Hold time 4 FE	t _{h4}				9, 10, 11		5	ns
Setup time 5 C _n	t _{s5}				9, 10, 11	18		ns
Hold time 5 C _n	t _{h5}				9, 10, 11		5	ns
Setup time 6 D _i	t _{s6}				9, 10, 11	25		ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55° C ≤ T _C ≤ +125° C V _{CC} = 5.0 V ±10% unless otherwise specified	Group A subgroups	Limits		Unit	
				Min	Max		
Hold time 6 D _i	t _{h6}	See figures 5 and 6 C _L = 50 pF	9, 10, 11		0	ns	
Setup time 7 OR _i	t _{s7}		9, 10, 11	25		ns	
Hold time 7 OR _i	t _{h7}		9, 10, 11		0	ns	
Setup time 8 S ₀ S ₁	t _{s8}		9, 10, 11	29		ns	
Hold time 8 S ₀ S ₁	t _{h8}		9, 10, 11		0	ns	
Setup time 9 ZERO	t _{s9}		9, 10, 11	29		ns	
Hold time 9 ZERO	t _{h9}		9, 10, 11		0	ns	
Propagation delay 1-2 from (input): D _i	t _{pd1}		9, 10, 11			20	ns
To (output): Y							
To (output): C _{n+4}	t _{pd2}					25	ns
Propagation delay 3-4 from (input): S ₀ S ₁	t _{pd3}		9, 10, 11			29	ns
To (output): Y							
To (output): C _{n+4}	t _{pd4}					34	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C V _{CC} = 5.0 V ±10% unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Propagation delay 5-6 from (input): OR _i	t _{pd5}	See figures 5 and 6 C _L = 50 pF	9, 10, 11		20	ns
To (output): Y						
To (output): C _{n+4}	t _{pd6}			25	ns	
Propagation delay 7 from (input): C _n	t _{pd7}		9, 10, 11		16	ns
To (output): C _{n+4}						
Propagation delay 8-9 from (input): ZERO	t _{pd8}		9, 10, 11		30	ns
To (output): Y						
To (output): C _{n+4}	t _{pd9}		9, 10, 11		35	ns
Propagation delay 10 from (input): OE low (enable)	t _{pd10}		9, 10, 11		25	ns
To (output): Y						
Propagation delay 11 from (input): OE high(disable)	t _{pd11}	9, 10, 11		25	ns	
To (output): Y						
Propagation delay 12-13 from (input): Clock S ₁ , S ₀ = LH	t _{pd12}	9, 10, 11		45	ns	
To (output): Y	t _{pd13}					
To (output): C _{n+4}				50	ns	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Propagation delay 14-15 from (input): Clock $S_1, S_0 = \text{LL}$	t_{pd14}	See figures 5 and 6 $C_L = 50\text{ pF}$	9, 10, 11		45	ns
To (output): Y						
To (output): C_{n+4}	t_{pd15}				50	ns
Propagation delay 16-17 from (input): Clock $S_1, S_0 = \text{HL}$	t_{pd16}		9, 10, 11		53	ns
To (output): Y						
To (output): C_{n+4}	t_{pd17}				58	ns
Minimum clock low time	t_{CL}		9, 10, 11	20		ns
Minimum clock high time	t_{CH}		9, 10, 11	20		ns

1/ Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed 1 second.

2/ Apply GND to $C_n, R_0, R_1, R_2, R_3, OR_0, OR_1, OR_2, OR_3, D_0, D_1, D_2$ and D_3 . Other inputs high. All outputs open. Measured after low to high clock transition.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.5. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

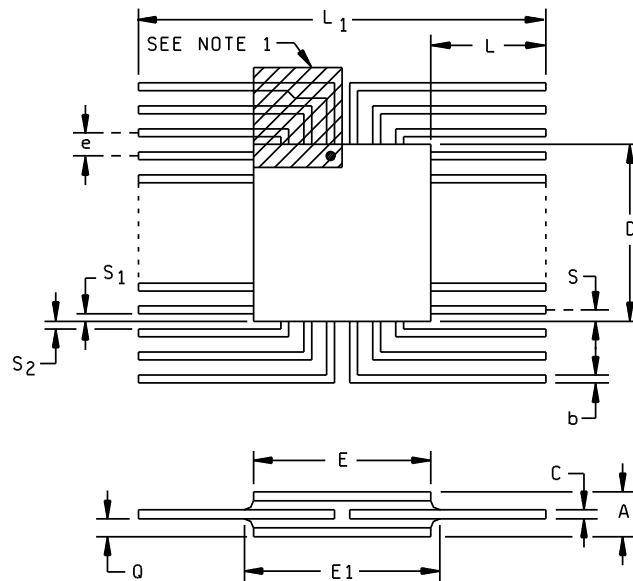
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Parameter	Min.	mm	Max.	mm
A	.055	.13	.090	2.29
b	.015	.38	.019	.48
C	.004	.10	.006	.15
D	.370	9.40	.415	10.54
E	.370	9.40	.415	10.54
E1	—	—	.420	10.67
e	.045	1.14	.055	1.40
L	.250	6.35	.320	8.13
L1	.920	23.37	.980	24.89
Q	.020	.51	.040	1.02
S	—	—	.045	1.14
S1	.005	.13	—	—
S2	.004	.10	—	—

NOTES:

1. Index area: A notch, tab, or pin one identification mark shall be located within the shaded area shown.
2. D and E1 allow for off-center lid meniscus and glass overrun.
3. All leads in dimensions b and c increase by 3 mils maximum limit, when tinplate/solder dip lead finish applied.
4. Exterior of frames to be of any shape, as long as electrically continuous with all leads and meets outside frame dimension measurement.
5. All dimensions are given in inches.

FIGURE 1. Case outline Y.

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CASES X,Y, AND Z

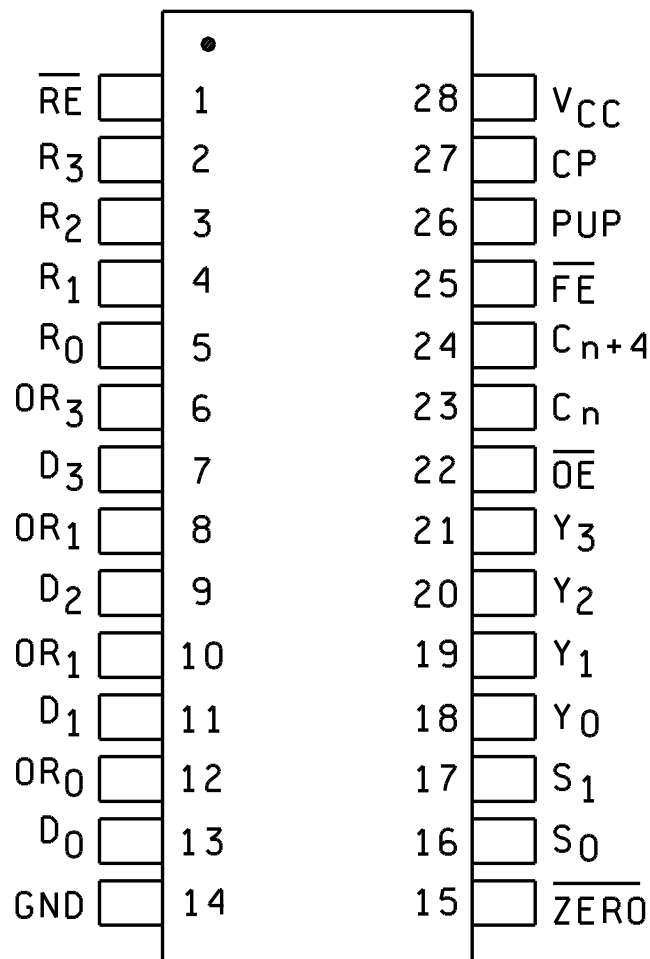


Figure 3. Terminal connections.

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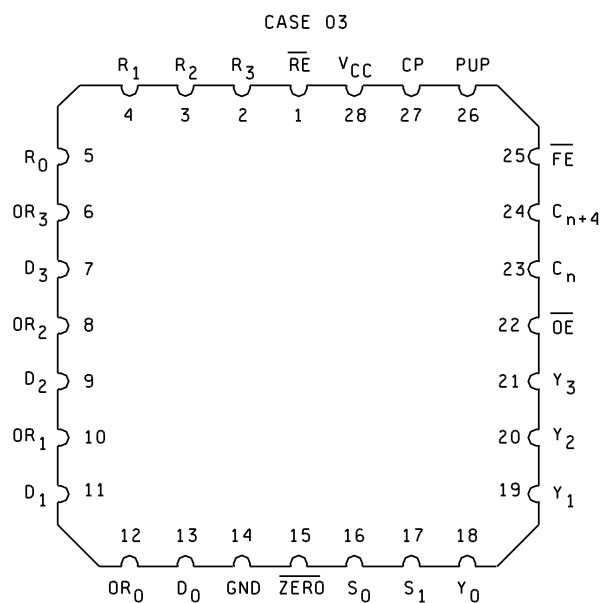


FIGURE 3. Terminal connections - Continued.

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Address selection			
S ₁	S ₀	Source for Y outputs	Symbol
L	L	Microprogram Counter	μPC
L	H	Address/holding register	AR
H	L	Push-pop stack	STKO
H	H	Direct inputs	D _i

Output control			
OR1	ZERO	GE	Y ₁
X	X	H	Z
X	L	L	L
H	H	L	H
L	H	L	Source selected by S ₀ S ₁

Z= High impedance

Synchronous stack control		
FE	PUP	Push-pop stack change
H	X	No change
L	H	Increment stack pointer, then push current PC onto STKO
L	L	Pop stack (decrement stack pointer)

H = High
L = Low
X = Don't care

FIGURE 4. Truth table.

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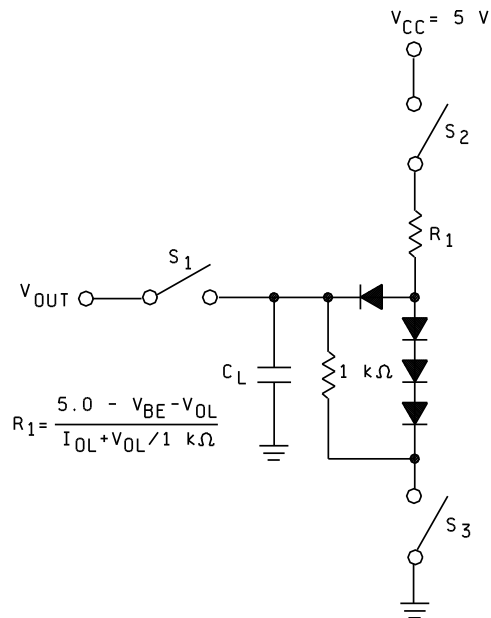
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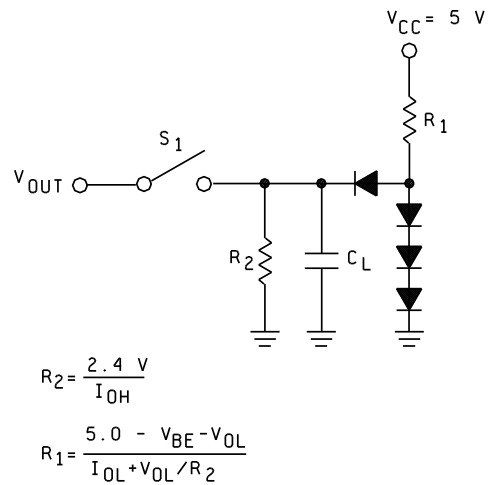
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SWITCHING TEST CIRCUIT

A. THREE-STATE OUTPUTS



B. NORMAL OUTPUTS



Test output loads

Pin no.	Pin label	Test circuit	R ₁	R ₂
18-21	Y ₀₋₃	A	220Ω	1 kΩ
24	C _{n+4}	B	220Ω	2.4 kΩ

NOTES:

1. C_L = 50 pF includes scope probe, wiring and stray capacitances without device in test fixture.
2. S₁, S₂, S₃ are closed during function tests all and AC tests except output enable tests.
3. S₁ and S₃ are closed while S₂ is open for t_{pd10} high test.
4. S₁ and S₂ are closed while S₃ is open for t_{pd10} low test.

FIGURE 5. Switching test circuit.

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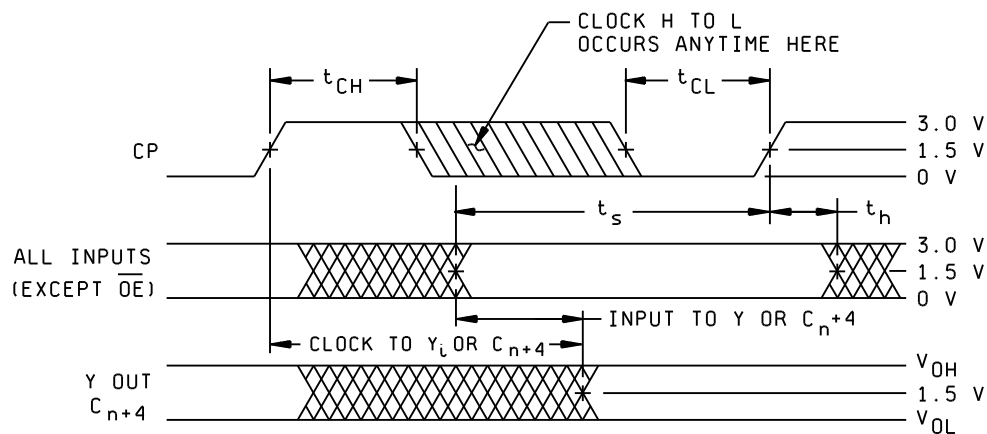


FIGURE 6. Switching waveforms.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A = +125^{\circ}\text{C}$, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 4, 5, and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroups 7 and 8 shall include verification of the truth tables.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A = +125^{\circ}\text{C}$, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	—
Final electrical test parameters (method 5004)	1*, 2, 3, 7, 8, 9
Group A test requirements (method 5005)	1, 2, 3, 7, 8, 9, 10**, 11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.

** Subgroups 10 and 11, if not tested, shall be
guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

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6.4 Pin descriptions.

Name	I/O	Description
S_1, S_0	I	Control lines for address source selection.
$\overline{FE}, \overline{PUP}$	I	Control lines for push/pop stack.
\overline{RE}	I	Enable line for internal address register.
OR_i	I	Logic OR inputs on each address outline line.
\overline{ZERO}	I	Logic AND input on the output lines.
OE	I	Output enable. When OE is high, the Y outputs are off (high impedance).
C_n	I	Carry-in to the incrementer.
R_i	I	Inputs to the internal address register.
D_i	I	Direct inputs to the multiplexer.
CP	I	Clock input to the AR and μPC register and push-pop stack.
Y_i	O	Address outputs (address inputs to control memory).
C_{n+4}	O	Carry out from the incrementer.

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6.5 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
8602701XX	34335 50088 50088	AM2909A/BXA TS2909AMCB/C TS2909AMJB/C
8602701YX	34335	AM2909A/BYA
86027013X	34335 50088	AM2909A/B3A TS2909AMEB/C
8602701ZX	34335	AM2909A/BYA

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE
number

Vendor name
and address

34335

Advanced Micro Devices, Incorporated
P.O. Box 3453
901 Thompson Place
Sunnyvale, CA 94088

50088

Thomson Components Mostek Corporation
1310 Electronics Drive
Carrollton, TX 75006

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